

# CARB LIGHT-DUTY OBD REGULATION UPDATE

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# **Background**

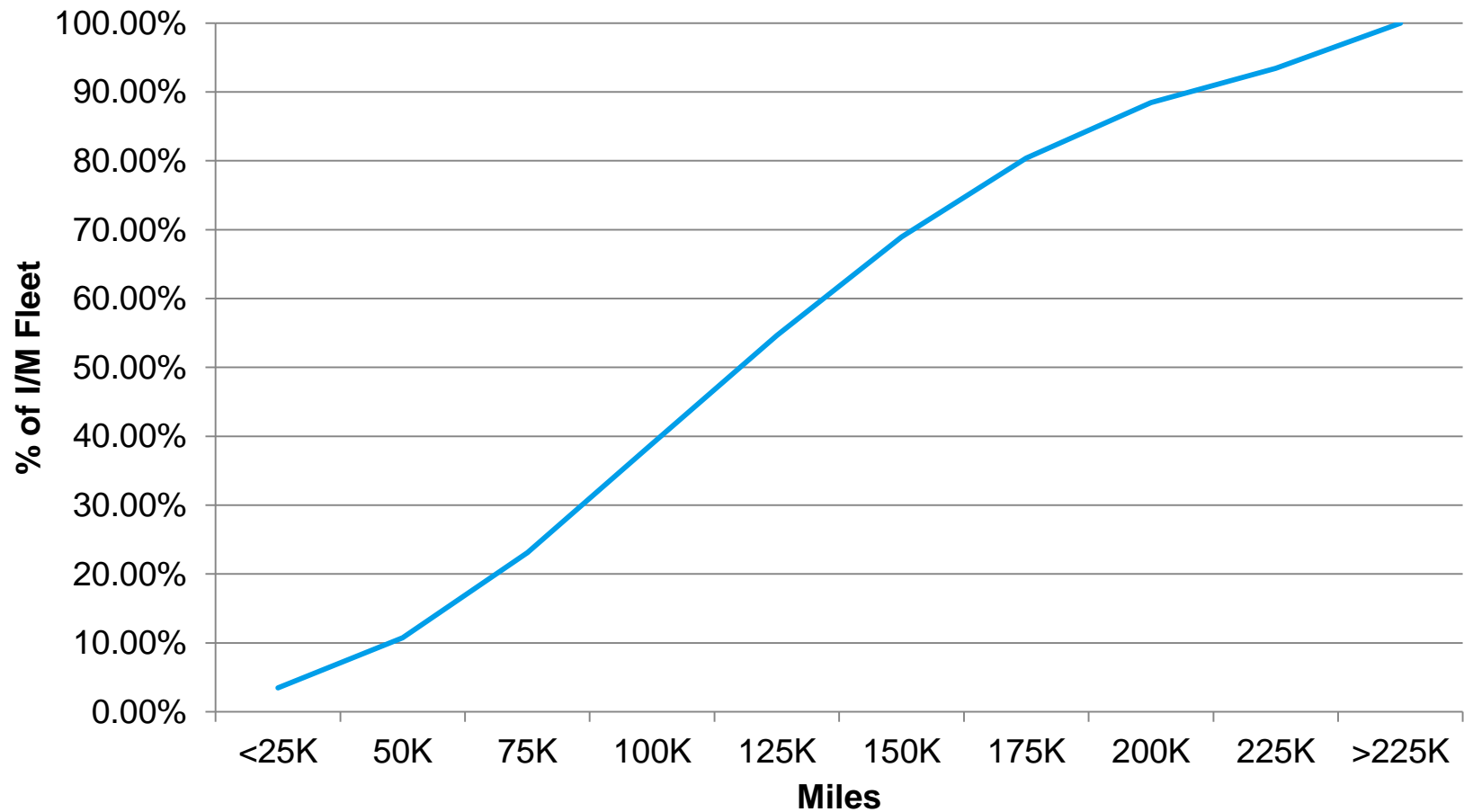
Recent Changes

Upcoming Issues

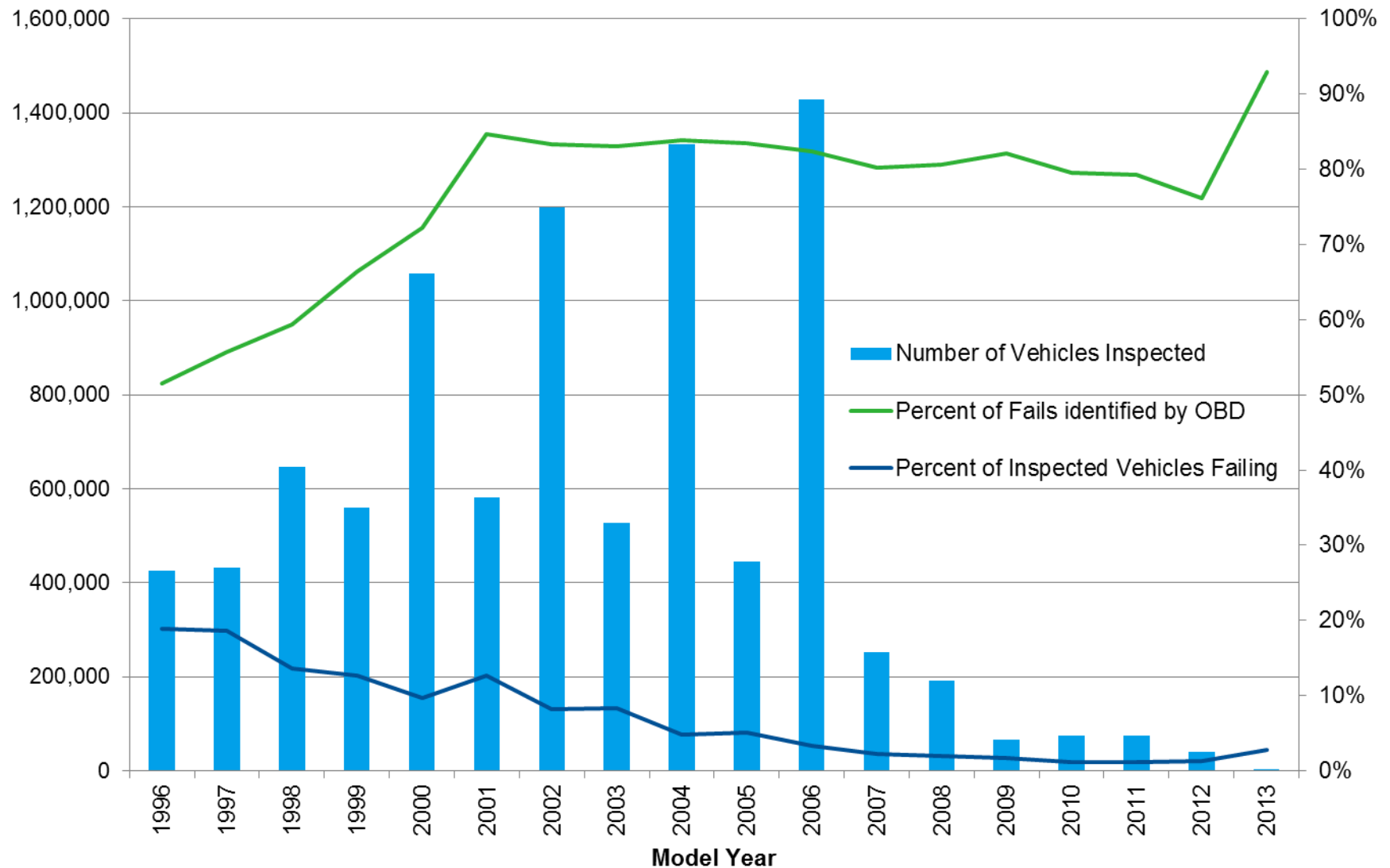
Recent In-Use Issues

- Over 20 years since first systems introduced
- Dominant technology used by IM programs
  - Identify vehicles in need of repair
  - Facilitate quick and accurate inspection
  - Facilitate effective repairs
- Only standard that directly addresses emissions beyond useful life

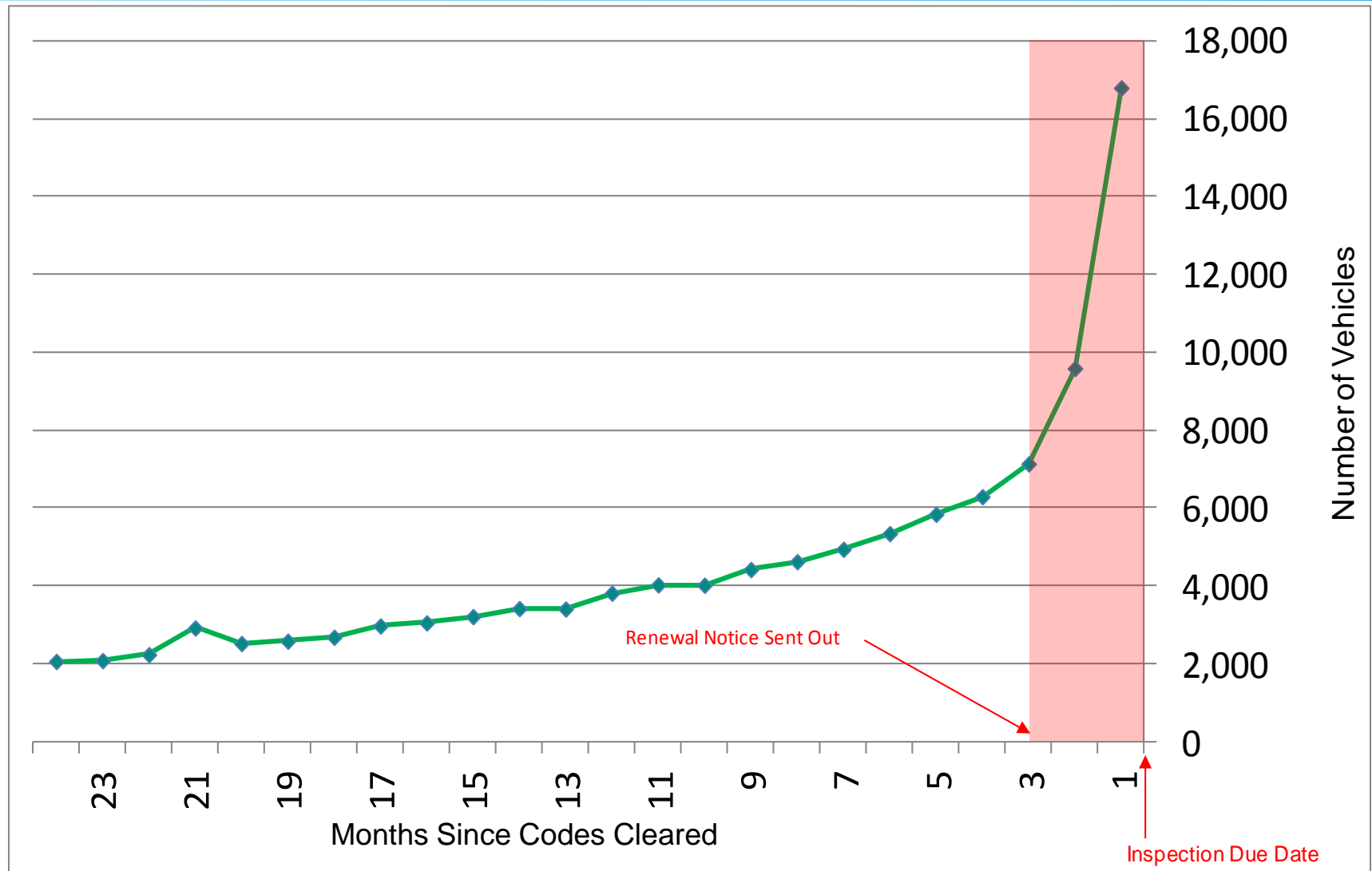
## Cumulative % of I/M Fleet by Mileage



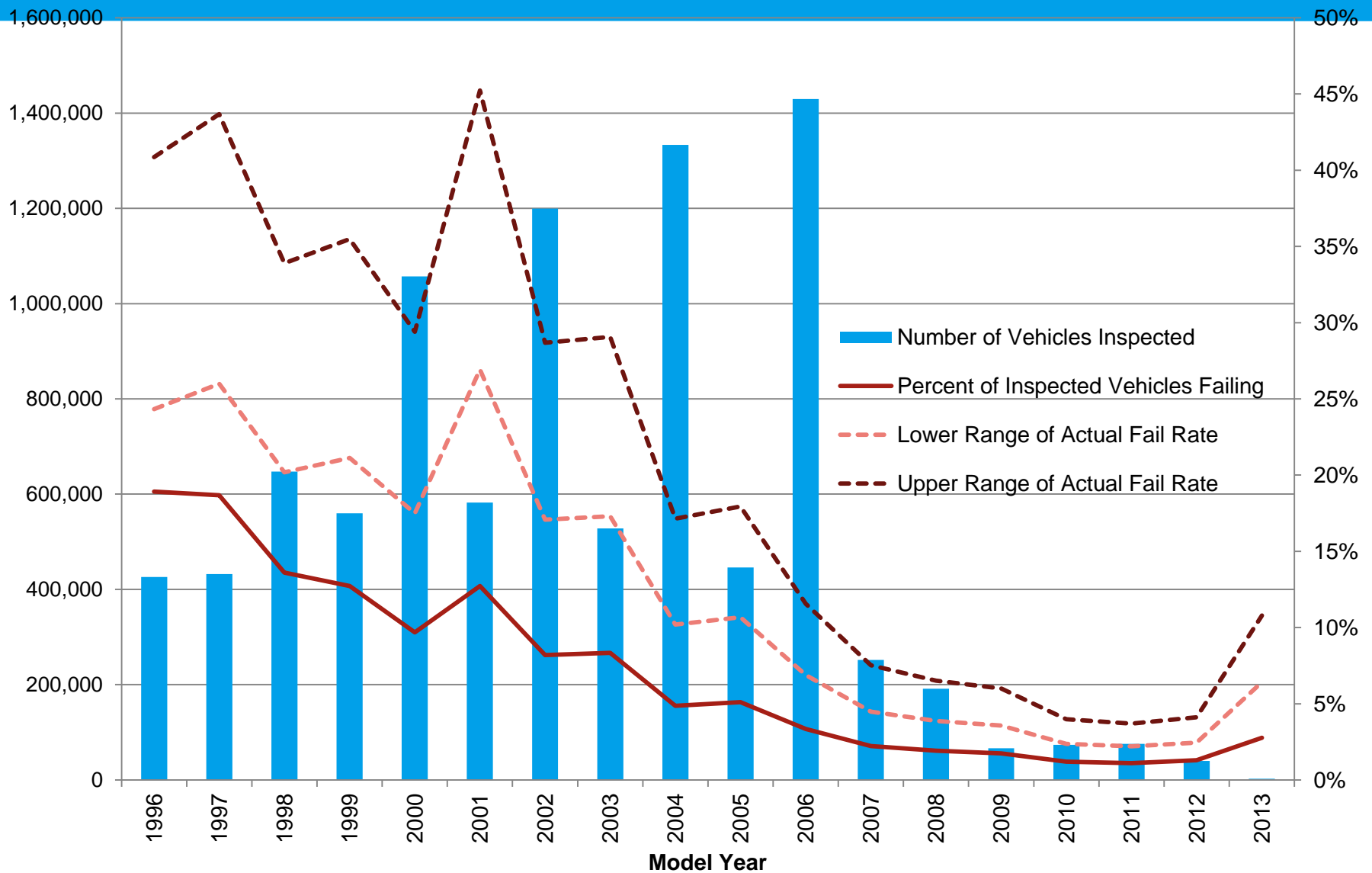
# 2012 Inspection Data from California Smog Check Program



# Significant Activity Leading up to Inspection



# Estimated Actual Fail Rates



Background

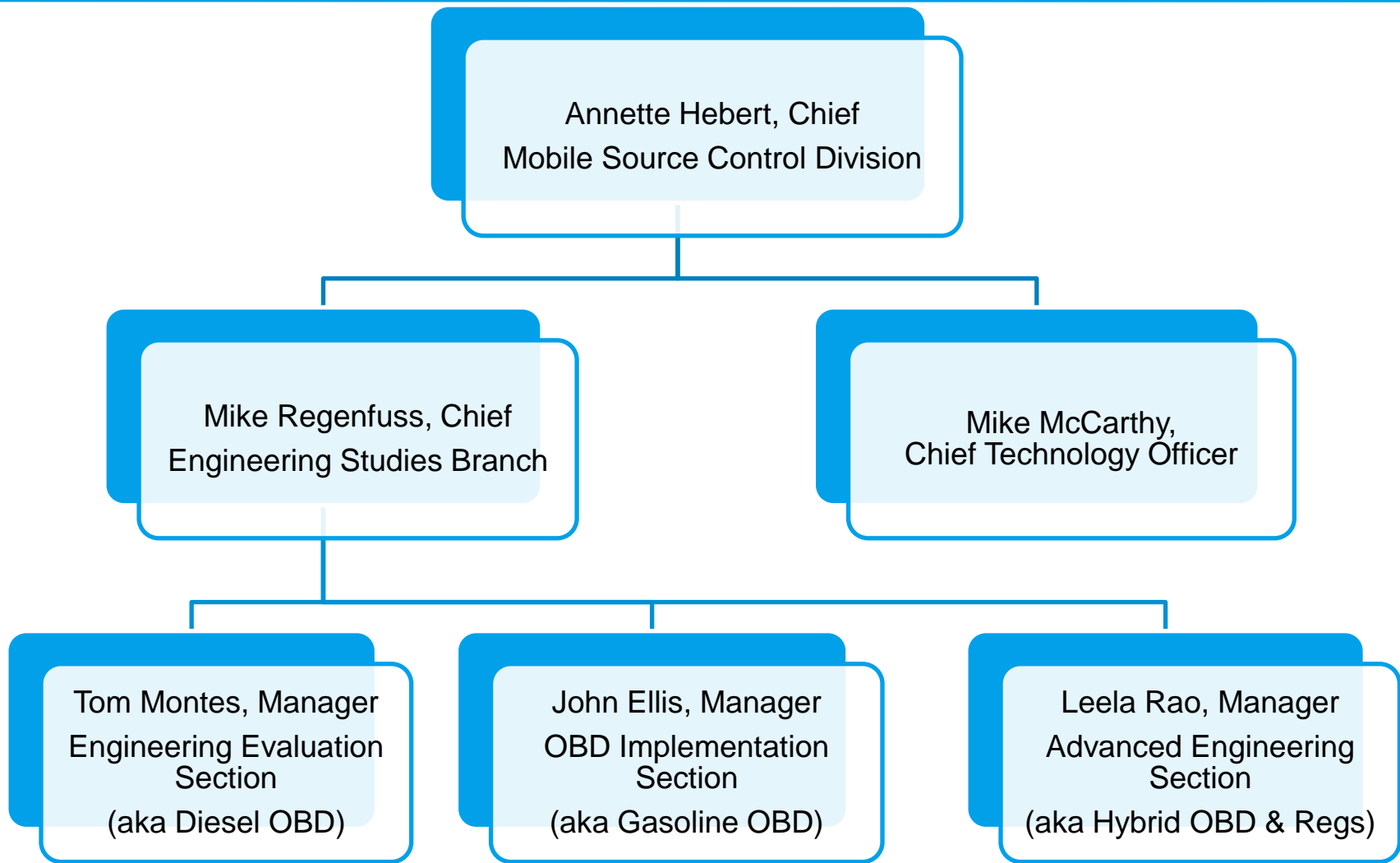
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# Management and Personnel Changes



## What is it?

- Essentially, electronic submission of application
- Structured order and file naming of portions of the application

## Status:

- All manufacturers now submitting applications via DMS

## Remaining Issues:

- More scrutiny on file naming/structure of application
  - Quicker ability to recognize and reject incomplete applications
- Submittal of 'post-' certification documents not always being done
  - Production Vehicle Evaluation (PVE) data
  - CAL ID/CVN tables
  - Quarterly deficiency payment submittal letters
  - Running changes

## DMS

- Allows better tracking of total volume and timing of pending workload
- Adhering to structure and naming conventions facilitates certification
- Quick identification of missing parts and earlier feedback

## Timing and Priority Factors:

- First in, first out
- Manufacturers' deadlines and priorities
- ARB target: within 90 days after submission of complete application
  - ARB will respond within 30 days if parts of application are missing (i.e., what should be in DMS)
  - Demonstration data may be submitted later but with adequate review time
  - Manufacturers should plan for 90 day review

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## Light-duty (OBD II) overdue for an update

- 2006 was last update dedicated to light-duty changes
- HD + LD certification still consuming majority of available resources

## Status:

- Plan to begin a rulemaking in 2014 calendar year
- If needed, could pursue inserting minor model year critical changes into a tailpipe regulatory update in 2014

## General areas of update:

- Normal 'clean-up' items
- Changes to match LEV III
- Added direction on hybrid system monitoring
- First steps on OBD role in greenhouse gas (GHG) emissions?

# Likely Areas of Changes

## LEV III related changes:

- OBD threshold based on HC+NO<sub>x</sub> standard and new categories (e.g., ULEV50)
- Direct Ozone Reduction (DOR) threshold change

## Hybrid changes:

- Powertrain and OBD system boundary definitions
- Further clarity on HVAC interaction (battery cooling, intrusive IC engine operation for cabin heat, etc.)
- Misfire detection logic changes (in lieu of 4x1000 rev fails to set a fault)

## GHG interaction:

- Inclusion of powertrain GHG emission reduction components/strategies?
  - Functional vs. emission threshold monitors
  - Big impacts vs. all measurable impacts
  - Likely first affected systems include stop/start technologies and regenerative braking

# LEV III Gasoline Thresholds

Emission Std	Emission Std				OBD Thresholds							Catalyst Threshold					
	HC+NOx	HC	NOx	CO	HC+NOx Multiplier	HC+NOx THD	HC Multiplier	HC THD	NOx Multiplier	NOx THD	Compared HC+NOx THD	Multiplier	HC+NOx	HC Multiplier	HC	NOx Multiplier	NOx
LEV 160 (LEVII)	0.160	(0.090)	(0.070)	4.2	1.5	0.240	-	-	-	-	0.240	1.75	0.280	-	-	-	-
ULEV 125 (ULEVII)	0.125	(0.055)	(0.070)	2.1		0.188	-	-		-	0.188		0.219	-	-	-	-
Bin 4	-	0.070	0.040	2.1	-	-	1.5	0.105	2.5	0.100	0.205	-	-	1.75	0.123	2.5	0.100
Bin 3	-	0.055	0.030	2.1		-		0.083		0.075	0.158	-	-		0.096		0.075
ULEV 70	0.070	-	-	1.7	2.0	0.140	-	-	-	-	0.140	2.0	0.140	-	-	-	-
ULEV 50	0.050	-	-	1.7		0.100	-	-		-	0.100		0.100	-	-	-	-
SULEV30 (SULEVII)	0.030	(0.010)	(0.020)	1.0	2.5	0.075	-	-	-	-	0.075	2.5	0.075	-	-	-	-
SULEV20	0.020	-	-	1.0		0.050	-	-		-	0.050		0.050	-	-	-	-

- Same as presented by Mike McCarthy at 2012 SAE OBD events.

## Connector (J1962):

- Updated J1962 with more restrictive orientation and access
- Likely will prohibit any form of cover/access panel in regulation

## Data (J1979) - a few additions/refinements:

- For PHEVs, tracking of 'plug-in' (~charge depleting) vs IC engine (~charge sustaining) usage
  - Ideas: cumulative miles, maybe cumulative energy usage (kWh or gal.)
  - Uses: Inform future policy decisions on ZEV credits, inventory, usage habits over full useful life
- For all HEVs, more consistent battery pack state of charge (SOC) reporting including flag to indicate charge-sustaining or charge-depleting mode of operation
- For all vehicles, some metric(s) of fuel economy:
  - Likely will need to be binned/normalized in some manner
  - Lifetime, instantaneous, and something in between
  - Uses: Inform future policy, test cycle versus in-use comparisons, off-cycle GHG credits, degradation over full useful life



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## Permanent DTCs (PDTC):

- Oregon is first state collecting (not yet using) the data
- Good news
  - Predominantly working as expected
  - Clear examples of where it is a refinement to readiness criteria

Year	Make	Model	Test#	Test result	MIL status	Readiness	\$03 DTC	PDTC	Miles SCC	W/Ups SCC	Miles w/MIL
2012	VW	Jetta	1	Not-Ready	Pass	CCCCUNNUCCC		P2279	19.375	0	0
			2	Not-Ready	Pass	CCCCUNNUCCC		P2279	33.75	0	0
			3	Fail	Fail	CCCCUNNUCCC	P2279	P2279	45.625	0	11.25
2010	VW	Jetta	1	Fail	Fail	CCCCUNCUCCC	P2404	P2404	147.5	9	24
			3	Pass	Pass	CCCCUNCUCCC		P2404	50	2	0
2010	BMW	X5	4	Not-Ready	Pass	CNCNNUCUNNN		P2201	20	2	0
			5	Not-Ready	Pass	CNCNNUCUNNN		P2201	15	2	0
			6	Not-Ready	Pass	CNCNNUCUCNN		P2201	34.375	2	0

## Permanent DTCs:

- Not so good news
  - Some issues/anomalies discovered

### Issue #1 :

- Same PDTC often showing up for a particular year/make/model
- “Mileage since codes cleared” PID equaled odometer reading on vehicles
- Root cause: Fault set on assembly line before final learning done and code clear logic didn't work right

### Issue #2:

- Several miscellaneous cases being investigated where PDTC is stored and mileage since code clear is very high (e.g., > 4,000 miles & >255 warm-ups)
- Root cause(s) (TBD): Possibilities include hard to run monitors, inappropriate use of similar conditions to clear permanent DTC, improper clear logic

# Additional Issues: Non-Emission Related Fault Interaction with OBD

- Issue #1:

- I/M data revealed some non-MIL, non-emission DTCs reported in Mode \$03

- Root Cause:

- Manufacturer mapped many non-MIL powertrain faults to report as emission-related to make the codes accessible to generic scan tool
  - Downside in I/M, techs pursue repair of all Mode \$03 faults to get a MIL off
  - Increased cost of repairs for no emission benefit

- Issue #2:

- Testing by ARB staff and manufacturers revealed major monitors disabled without a MIL or emission-related fault

- Root Cause:

- Internal software flag(s) were incorrectly mapped to disable OBD monitors
  - “Extra” fault paths were not properly turned off in software and could cause disablement
  - Default strategies (e.g., back up signals) were not implemented correctly

Official CARB documents available from

▮ [www.arb.ca.gov](http://www.arb.ca.gov)

Direct link to OBD page:

▮ <http://www.arb.ca.gov/msprog/obdprog/obdprog.htm>

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